

sciences in the age in which he lives. What is accomplished in one generation is the foundation for the achievements of the next.

That the subject is not exhausted we may easily see by remarking the progress that has been made in one of its departments most easily reviewed, since Prof. Forel finished that part of his work. In biology, even in the simple cataloguing of the lacustrine animals and plants, it is obvious that the work accomplished under his guidance is no more than a beginning in this direction, and specialists in any branch find abundance still to do. It is with no intention of belittling the work of Prof. Forel that this aspect of the subject is adverted to. It is a great work patiently carried through, and will serve as a foundation for all future limnological studies.

#### HENRY SIDGWICK'S ESSAYS.

*Miscellaneous Essays and Addresses.* By Henry Sidgwick. Pp. vii+371. (London: Macmillan and Co., Ltd., 1904.) Price 10s. net.

IN this volume we have the first instalment of the shorter essays of that brilliant thinker, Henry Sidgwick. They have been chiefly collected from journals and reviews, but two are now published for the first time. His philosophical lectures and papers are reserved for a companion volume. In a way, the selection of articles now before us illustrates a period of thirty-six years of the life of one of the most striking personalities of our time, and on that account, and from their breadth of view, they have a value even though the occasion of their appearance is long past.

Of the sixteen papers, six are literary or critical, six deal with questions of socialism and economics, and four with education and university affairs. We were surprised and somewhat disappointed to find no reminiscence of his activity in connection with the education of Englishwomen, but perhaps more may be expected when the histories of Newnham and Girton come to be written.

A detailed review of the essays on Shakespeare, Matthew Arnold, and Clough, or of those on political economy or sociology, hardly falls within the sphere of this Journal, but few of our readers who are interested in the burning question of the best education for men of science will regret having read Sidgwick's essay on "The Theory of Classical Education," reprinted from F. W. Farrar's "Essays on a Liberal Education," which was originally published in 1867. In the light of the recent controversy on the Greek question much of this excellent paper reads as if it had been written yesterday, and it is difficult to avoid the reflection that if several of the writers of controversial letters to the *Times* had read this essay of forty years ago, both their matter and manner might have been improved.

With respect to the classical element in a scientific education, Sidgwick was of opinion that although science had at length broken its connection with what was so long the learned language of Europe, yet everyone who aspires to become a "learned" man of science will require to read Latin with ease, but that

the sole stock-in-trade of Greek necessary for him would be a list of words that he could learn in a day and the use of a dictionary that he might acquire in a week. In other words, he appeared to be in favour of the retention for the highest class of science students of that modicum of Greek which is at present compulsory at Oxford and Cambridge, only he would perhaps have liked to see it reduced and treated as a distinct part of the direct teaching of English.

A clear distinction is drawn between natural and artificial educations, and between the effects of literary and of scientific training. With regard to the latter Cuvier's famous remark is quoted with approbation:—

"Every discussion which supposes a classification of facts . . . is performed after the same manner; and he who has cultivated this science merely for amusement, is surprised at the facilities it affords for disentangling all kinds of affairs."

He admits that a student of languages could not honestly claim an analogous advantage for his own pursuit. The editors are justified in the inclusion of the essay on "Idle Fellowships" in spite of the fact that the evils of which it complains have greatly diminished. The general educational considerations discussed are of so wide a bearing that they are not less true now than in 1876, when the essay was published.

We feel certain that those who peruse this volume will share our gratitude to the editors for their share in the re-publication.

#### OUR BOOK SHELF.

*The Insulation of Electric Machines.* By H. W. Turner and H. M. Hobart. Pp. xvi+297. (London: Whittaker and Co., 1905.) Price 10s. 6d. net.

THE perfecting of the modern dynamo electric machine, and the necessity of high potential differences have within recent years quite altered our ideas about insulation. Electrical engineers have come to view the subject from a different standpoint on account of the importance of disruptive strength of the material apart from conduction pure and simple. The book under review appears at a very appropriate time. Our knowledge of the physical properties of insulators is now sufficient, and the want of a really good book on the subject is great enough to justify its appearance. It will be welcomed by the electrical engineer as a most valuable addition to his library.

The book opens with an account of the requisites for insulating materials, and the most perplexing phenomena met with during the testing of the same. Why is it that air has comparatively such low dielectric strength, and yet it is a very good insulator as ordinarily understood? Again, why does the apparent dielectric strength per unit thickness of such a substance as mica vary with the thickness? These and many other matters difficult to understand are laid before the reader. The properties of insulating materials and the influences of temperature and moisture upon them are next dealt with. The authors quite rightly lay stress upon the testing of insulators at, or even exceeding, their working limits of temperature, and the futility of baking to obtain temporary insulation unless moisture be permanently excluded. When dealing with the influence of brush discharge mention might with advantage have been made of the production of nitric acid, and the ultimate

breaking down of the insulation. The production of ozone—the forerunner of the above effect—is a matter of the utmost importance to electrical engineers, especially in damp climates.

That portion of the book dealing with varnishes is most valuable. The pros and cons. of the use of linseed oil, which undoubtedly has a very extended use at the present time, and other acid bodies are well set forth, as are those of the use of insulators of paraffin origin. The uses to which oils can be put as insulators, their various characteristics, their purity and methods for purifying and drying are carefully dealt with. Presspahn-mica is advocated instead of micanite for high tension working.

An important part of the work is that which deals with insulation of armatures, field-coils, and transformers. It is well shown upon what the so-called "space-factor," that is the ratio of area of copper to gross area of slot, depends. Very valuable suggestions are made with regard to pressure tests. Long time high pressure tests are likely to injure apparatus, and are not recommended—a few seconds' application is sufficient. The appliances in use for taping and handling insulation material, and a most interesting description of the tools employed, together with a useful bibliography, close what is really a valuable book. The printing is good, and the illustrations are excellent.

ERNEST WILSON.

*Insect Life. A Short Account of the Classification and Habits of Insects.* By Fred. V. Theobald, M.A. With numerous illustrations (53 in the text). Second edition, revised. Pp. xi+235. (London: Methuen and Co., 1905.) Price 2s. 6d.

The first edition of this work was published in 1896, and the public interest in entomology is evidenced by the increasing number of books on the subject which reach a second edition within a comparatively short time of publication. A cheap popular illustrated book on insects seems at present to be assured of a sale at least sufficient to cover expenses, which was not the case a few years ago.

The second edition is exactly similar to the first as regards its size, illustrations, and general contents; but here and there we notice occasional additions. There is much useful information in the book, but we regret that the second edition has not been more carefully revised, for, apart from occasional misprints, several erroneous or obsolete statements contained in the first edition have been repeated in the second. Thus on p. 3 (note) we read, "The total number [of insects] described, however, is under 250,000." This is probably based on Kirby's estimate in his "Text-book of Entomology" (1885) of 222,000; but the later estimate given in the second edition (1892) was 270,000, which would require to be augmented by many thousands to be correct for 1905. On p. 87, "The so-called Apples of Sodom found near the Red Sea," should, of course, be the Dead Sea. While it is true, as stated on p. 105, that *Danaus chrysippus* is the only European species of the genus, the much larger insect occasionally found in England is the common North American *D. erippus* (or *D. archippus*), introduced, but which may not improbably become naturalised in Europe, and has established itself within the last half-century in many of the Pacific Islands, as well as in Australia and New Zealand. Lastly (p. 166), it is possible that the bite of the species of tsetse fly which destroys cattle in South Africa may be "comparatively harmless to man"; yet, as Mr. Theobald must certainly know, the terrible sleeping sickness of Western and Central Africa is now ascribed to the bites of different species of tsetse flies infesting those regions.

We hope that when this little book reaches a third

edition Mr. Theobald may have an opportunity of enlarging it, for entomology, like other sciences, advances so rapidly that it is not possible to bring it up to date, unless the author gives himself a free hand in this direction.

*The Radial Area-Scale.* Patented by R. W. K. Edwards. (Richmond, Surrey: Morgan and Kidd.) Price 3s. 6d.

THIS ingenious instrument is designed for use in finding the approximate areas of irregular plane figures such as indicator diagrams. It consists of a sheet of transparent celluloid marked with eleven scales on lines radiating from a point at equal angular intervals of about  $3^\circ$ , and so divided that a scale reading is proportional to the area of a sector from the centre up to that point. When used, the sheet is laid over the figure to be measured, and is adjusted until the figure is just contained within the bounding radials, with its outline cutting the nine inner scales each in two points. The outer and inner readings at these points are now taken and the two sets added; the difference between the two sums gives the required area. The entire operation occupies about three minutes. Applied by the writer to a 3" circle and a 6" semicircle, the results were correct in both cases to within  $\frac{1}{4}$  per cent. As the outside radials include an angle of about  $30^\circ$ , the instrument is quite quickly adjusted over large or small figures of any shape, and the scales are clear and easy to read. To ensure a good approximation, Simpson's rule has been cleverly applied in figuring the scales. The instrument seems likely to be of considerable service, and should be widely known.

*A Preparatory Course in Geometry.* By W. P. Workman and A. G. Cracknell. Pp. viii+56. (London: W. B. Clive, 1905.) Price 9d.

THE little book by Messrs. Workman and Cracknell is preparatory to a forthcoming work on "Geometry, Theoretical and Practical," on which the authors are now busily engaged. It consists essentially of a set of exercises on the accurate scale drawing of lines, angles, triangles, and polygons, and requires the reading off of quantitative results as regards lengths and angles. Areas, ratios, and the general properties of circles are not reached in this volume. It trains the youth in the proper use of the drawing-pencil, straight-edge, scale, protractor, set-square, and compass, and gives him a concrete knowledge of, and practical insight into, geometrical truths as a preliminary to more formal work. Teachers using the book would do well when valuing class work to act on a suggestion contained therein, and give varying credit according to the degree of accuracy disclosed by the results. The book gives good promise of another very interesting class book of elementary geometry.

*The Evolution of the World and of Man.* By George E. Boxall. Pp. xi+191. (London: T. Fisher Unwin, 1905.) Price 5s.

A SINGLE example to show how Mr. Boxall proposes to supplement the deficiencies in the story of evolution as told by science will enable possible readers to estimate the value of his book. On p. 30, after stating that geology tells us the order in which various strata were laid down, he continues:—"but no attempt has as yet been made to estimate the temperature, for instance, when the granite was first deposited, and yet this should not be a difficult problem to solve. Thus, of the true metals, aluminium is the only one which appears in the granite, . . ." and the account continues with the same disregard of scientific fact. Mr. Boxall expresses his own view of the value of the book by not troubling to provide an index to it.